SECTION I.—AEROLOGY.

THE DIURNAL PERIOD OF THE WIND VELOCITY.

During 1912 and 1913 Prof. G. Hellmann (1) has studied the vertical change in wind velocity in winds up to moderate distances above the earth's surface. These studies have helped to reach the following conclusions concerning the diurnal periods of the velocity at different levels.—C. A., jr.

When one reviews all the facts heretofore learned concerning the diurnal period of the wind velocity, supplementing them with those brought out [in (1)], one comes to hold the view that the principal wind phenomenon of the higher levels of the atmosphere demanding explanation is the diurnal period.

In our region of the globe, viz, that of the prevailing westerlies, the diurnal period in the wind velocity, characterized by a nocturnal maximum and a daytime minimum, dominates the greater mass of the atmosphere. Throughout the year this diurnal period extends down to the surface of the ocean; but over the lands it extends only to within about 50 meters of their surface during the cold season and to within about 100 meters during the warm season, and with weak air movements down to within a few meters of the ground. Inversely, that diurnal period of the wind velocity characterized by a daylight maximum and a nocturnal minimum, is restricted to the corresponding lowermost atmospheric layers and in fact is found in all the wind districts of the land regions of the earth.

The Espy-Köppen theory, which is the most widely known, seeks to explain both types of the diurnal periodicity in the wind velocity by the effect of the ascending and descending air currents that develop over the continents during the day. The ascending currents weaken the higher lying air currents; the descending currents bring down from above more rapidly moving air and thereby increase the wind velocity of the lower strata.

Such convection currents are indeed adequate to explain the processes taking place in the lower air layers. It has, however, long been recognized as a fault in this theory that the daytime minimum in the wind velocity which occurs even during the winter at great altitudes, could scarcely be due to ascending air currents. To be sure, our knowledge of these upper air conditions is almost wholly due to observations at mountain stations, that is, at points on the earth's surface. A. Peppler's recent effort to use wind-velocity observations made by means of kites in deducing the period for the free-air winds has taught us, however, that here also the velocity minimum seems to occur during the daytime. The conclusion is still somewhat uncertain, since the measurements are numerically few and very unequally distributed among the different hours. On the other hand, the records secured from the summit of the Eiffel Tower (305 meters) are altogether in favor of the conclusion that the general character of the diurnal period of the wind velocity is the same for mountain summits as for the upper strata of the free air (2).

The writer finds that the cause of the diurnal period in the air currents of the main portion of the atmosphere, lies in the thermal wave which passes around the earth from east to west every 24 hours; a phenomenon which has already been pointed out, sometimes in quite different connections, by Kelvin, Margules, Gold, Möller, and others. In the morning the air of the more easterly regions is more strongly heated, thereby the isobaric surfaces in the east suffer elevation so that an overhead pressure gradient from east to west arises. The prevailing west wind must thereby be weakened, while after the thermal wave has crossed a given local meridian both the causes have the same sign and therefore tend to strengthen the wind velocity. For a locality in the Northern Hemisphere the region of maximum heating and the summit of the resultant great air wave, lies to the southeast in the morning, to the south at noon, and to the southwest in the afternoon, so that the resultant of the two effective forces must vary according as the general westerly drift of the air of the higher atmosphere inclines to come from the northwest, west, or southwest.

Is this view correct, then it may be expected that districts having predominantly east winds will have a diurnal period the opposite of the above, i. e., a daytime maximum. This is in fact the case. We have for some time known the remarkable fact that on the summits of the mountains of the southern East Indies the diurnal period of the wind velocity during the dominance of the southwest monsoon is similar to that of our own mountains (3); but that during the northeast monsoon the diurnal period is inverted, showing a daytime maximum. In these cases then, both the upper and the lower strata have the same hourly changes in wind velocity.

Our hypothesis gives, at the same time, an explanation of the fact that in the portion of the region of the northeast trades lying over the continents (northern Africa, northern South America), there is such a pronounced daily period to the wind velocity that the wind becomes almost stormy soon after noon while in the evening it sinks to a complete calm.

REFERENCES.

(1) **Hellmann, G.** Über die Bewegung der Luft in dem untersten Schichten der Atmosphäre. Met. Ztschr., Braunschweig, Jan., 1915, **32**: 1–16.

Also, Sitzber., K. preuss. Ak. d. Wissens., Phys.-math. Kl., 1914, Apr. 2. pp. 415–437. [Reprinted.]

(2) **Hann, J.** Der tägliche Gang der Windstärke auf dem Gipfel von Ben Nevis und seine Bedeutung für die Theorie. Met. Ztschr., 1912, **29**: 462.

(3) **Hann, J.** Die täglich Variation der Windstärke auf den Berggipfeln in Südindien. Met. Ztschr., 1898, **15**: 220. See also his Lehrbuch der Meteorologie. Leipzig, 1915. 3d. ed., p. 410.

THE ASCENT OF AIR ABOVE ACTIVE VOLCANOES.

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Besides the alarming eruption of glowing or hot lava fragments that accompanies a volcanic eruption, there is a second phenomenon that often is not less striking in external splendor and always furnishes an effective background for the former display, and that is the columns of steam rising above the crater and frequently sending down lightning, thunder, and rain.